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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/803,342	03/17/2004	C. Robert Koentzopoulos	LAM1P186/P1211	5586
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Beyer Law Group LLP P.O. BOX 1687 Cupertino, CA 95015-1687			EXAMINER ALANKO, ANITA KAREN	
			ART UNIT 1792	PAPER NUMBER
			MAIL DATE 01/06/2009	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/803,342

**Applicant(s)**

KOEMTZOPOULOS ET AL.

**Examiner**

Anita K. Alanko

**Art Unit**

1792

**Period for Reply** -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 25 September 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1, 3-19, 21 and 22 is/are pending in the application.
- 4a) Of the above claim(s) 15, 21 and 22 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 3-14 and 16-19 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/888)
- Paper No(s)/Mail Date 7/11/08.
- 4) ☐ Interview Summary (PTO-413)
- Paper No(s)/Mail Date \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

***Election/Restrictions***

Applicant's election without traverse of Group I in the reply filed on 9/25/08 is acknowledged.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 2, 10-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chantre et al (US 2001/0051413 A1) in view of Vallon et al (JVST A 1997) and Chen (EP 0200951 A2).

Chantre discloses a method of etching a stack (Fig.2a-2c) with at least one silicon germanium layer 3 [0018] over a substrate 1 [0017] in a processing chamber and a polysilicon

Art Unit: 1792

layer 4 [0018] over the silicon germanium layer, wherein at least one region of the polysilicon layer is doped [0018], comprising:

providing a silicon germanium etch ([0019], Fig.2c); and

providing a break through etch of the polysilicon layer over the silicon germanium layer, wherein at least one region of the polysilicon layer is doped, comprising:

providing an etchant gas into the processing chamber and transforming the etching gas to a plasma to etch the polysilicon layer (“anisotropic dry plasma etching”, [0018], Fig.2b).

However, Chantre fails to disclose the etchants for the various layers.

Vallon discloses a method for etching a stack (Fig.1) with at least one SiGe layer (see Fig.1) over a substrate (silicon substrate, Fig.1) in a processing chamber, comprising providing a silicon germanium etch, comprising:

providing an etchant gas into the processing chamber, wherein the etchant gas comprises HBr, an inert diluent (helium) and O<sub>2</sub> (page 1875, col.2, lines 2-3);

cooling the substrate to a temperature below 40 °C (25 °C, page 1875, col.2, line 2); and

transforming the etching gas to a plasma to etch the silicon germanium layer (page 1876, section III.A.)

It would have been obvious to etch the SiGe layer with HBr, an inert diluent (helium) and O<sub>2</sub> and to cool the substrate to a temperature below 40 °C in the method of Chantre because Vallon teaches that this is useful for patterning SiGe.

Chen teaches that an etchant gas of N<sub>2</sub>, SF<sub>6</sub> and CHF<sub>3</sub> is useful for etching silicon at high rates and anisotropy (see abstract, col.4, lines 1-14).

It would have been obvious to one with ordinary skill in the art to break-through etch the silicon with  $N_2$ ,  $SF_6$  and  $CHF_3$  in the method of Chantre because Chen teaches that it is a useful composition for etching silicon.

As to claim 10, it would have been obvious to vary the thickness to that cited in order to optimize the final product for best results.

As to claims 11-14, see the rejection of claims 5-8.

Claims 3-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chantre et al (US 2001/0051413 A1) in view of Vallon et al (JVST A 1997), Chen (EP 0200951 A2) and Yang et al (US 6,451,647 B1).

The discussion of modified Chantre from above is repeated here.

As to claim 3, Yang teaches that silicon may be etched with  $Cl_2$ ,  $HBr$ ,  $CF_4$  and  $O_2$  (col.11, lines 20-22, 32-33; col.14, lines 7-10).

It would have been obvious to main etch silicon with  $Cl_2$ ,  $HBr$ ,  $CF_3$  and  $O_2$  in the modified method of Chantre because Yang teaches it is a useful etching composition for silicon.

Thus, as to claims 1 and 3, Vallon, Chen and Yang all teach compositions for etching the layers cited in Chantre that need to be etched. All of the etching compositions perform their same function of etching as they did separately. One of ordinary skill in the art would have recognized that the results of the combination were predictable, that of etching to form a patterned structure. Therefore, all the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no

change in their respective functions, and the combination would have yielded predictable results to one of ordinary skill in the art at the time of the invention.

As to claim 4, since the modified method of Chantre is the same as the instant invention, the same results are expected.

As to claims 5-6, it would have been obvious to form a seed layer in the modified method of Chantre in order to improve the deposition of the SiGe layer because seed layers are conventional. The cited thicknesses are expected to be within the scope of one skilled in the art.

As to claims 7-8, Chantre discloses to use a mask [0018], but fails to disclose the type of mask. It would have been obvious to one with ordinary skill in the art to use the photoresist as cited in the method of Bu because it is a conventional photoresist and is expected to yield the predictable result of enabling patterning of the stack.

As to claim 9, it would have been obvious to include an undoped region, depending on the type of final product desired.

Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen (EP 0200951 A2) in view of Nallan et al (WO 00/04213).

Chen discloses that an etchant gas of  $N_2$ ,  $SF_6$  and  $CHF_3$  is useful for etching silicon at high rates and anisotropy (see abstract, col.4, lines 1-14). Chen fails to disclose etching polysilicon with both a doped and undoped regions.

Nallan teaches that it is known to provide polysilicon layer 170 with both a doped region 180a and an undoped region 180b (page 13, lines 2-4), which is thereafter patterned through a mask layer (page 13, lines 10-14).

It would have been obvious to etch polysilicon, comprising both doped and undoped regions as taught by Nallan, in the method of Chen because since silicon and polysilicon both have silicon, the etchant of Chen is expected to be useful for polysilicon.

Claims 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable Chen (EP 0200951 A2) in view of Nallan et al (WO 00/04213) and Yang et al (US 6,451,647 B1).

The discussion of modified Chen from above is repeated here.

As to claim 3, Yang teaches that silicon may be etched with Cl<sub>2</sub>, HBr, CF<sub>4</sub> and O<sub>2</sub> (col.11, lines 20-22, 32-33; col.14, lines 7-10).

It would have been obvious to main etch silicon with Cl<sub>2</sub>, HBr, CF<sub>4</sub> and O<sub>2</sub> in the modified method of Chen because Yang teaches it is a useful etching composition for silicon.

As to claim 18, Chen discloses to use a photoresist mask (abstract, last sentence).

As to claim 19, It would have been obvious to one with ordinary skill in the art to use the 193 or higher generation photoresist as cited in the method of Chen because it is a conventional photoresist and is expected to yield the predictable result of enabling patterning of the stack.

### ***Response to Amendment***

The 35 USC 102 rejection over Vallon is withdrawn since claim 1 has been amended to incorporate claim 2. The 35 USC 103 rejections over Bu are withdrawn since Bu does not disclose the new limitation of a polysilicon layer that is doped. The claims are rejected over newly cited Chantre and over Chen. For claim 1, Chantre is relied upon to teach the base method

of etching a stack wherein at least one region of the polysilicon layer is doped [0018]. For claim 16, Chen discloses etching of silicon, and Nallan is relied upon to teach that polysilicon can be doped and undoped.

### ***Response to Arguments***

Applicant's arguments with respect to claims 1, 3-14 and 16-19 have been considered but are moot in view of the new ground(s) of rejection.

Applicant argues that none of the references disclose an etch would be successful in etching polysilicon over SiGe without significantly damaging the SiGe. This argument is not commensurate in scope with the claim language and thus not persuasive because the claims broadly cite polysilicon over SiGe, not that they are contiguous. Damage is not cited in the claims.

Examiner notes that although the claims cite polysilicon with a doped region, they do not explicitly cite which region, doped/undoped, is etched. The regions need only be present in the polysilicon layer (as taught by Nallan), not specifically etched.

Applicant argues that Yang teaches that the etch process is able to equally etch through the polysilicon and SiGe. In response, Yang teaches that both layers can be etched, but does not teach that the etches are equal. It is obvious that different layers etch in different manners because of the different compositions present. It is well known to optimize etch steps (even within the same layer) according to the process at hand, for example, optimizing between speed of etch, cost, desired surface properties, the presence or absence of overetch, etc. There is thus



motivation to vary the etch steps based on composition and to optimize the process for best results.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anita K. Alanko whose telephone number is 571-272-1458. The examiner can normally be reached on Mon-Fri until 3:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Anita K Alanko/  
Primary Examiner, Art Unit 1792